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## Black holes and galaxies -- Missing link discovered in our own cosmic backyard

A team of Sloan Digital Sky Survey astronomers from Germany and the United States will announce today the discovery that galaxies and extremely massive black holes seem to grow together.

A team led by Dr. Guinevere Kauffmann of the Max-Planck-Institute for Astrophysics, Germany, and Professor Timothy Heckman of the Johns Hopkins University, USA, analyzed more than 120,000 galaxies from the Sloan Digital Sky Survey (SDSS). They found that more than 20,000 of them contained massive black holes in their centers that are currently active and growing in mass.

The discoveries were announced today at the Maps of the Cosmos Symposium, part of the International Astronomical Union's 25th General Assembly being in Sydney, Australia, July 13-26.

Remarkably, the scientists found that the more rapidly the black hole was growing, the faster the surrounding galaxy itself was growing by forming new stars.

'Like the chicken and the egg, neither black hole nor galaxy can be said to come first -- each is necessary for the other', Heckman said.

A black hole is an object so dense and massive, that nothing -- not even light (which travels at the fastest speed possible) -- can escape its gravitational pull. Some black holes are relatively small by astronomical standards, and are formed in the aftermath of the explosion of giant stars. But other black holes are absolutely gigantic -- with masses of up to millions or billions of times that of our Sun -- and reside in the centre of galaxies.

Our own Milky Way Galaxy is thought to harbor an enormous black hole at its centre.

The result is an important clue to an astrophysical mystery that has baffled astronomers for years, Kauffmann explained. It is now well known to astronomers that every large galaxy harbors in its heart a black hole weighing at least many million of times as much as the Sun.

Curiously, the mass of such central black holes is extremely closely related to the properties of the galaxies in which they are embedded. The Sloan Digital Sky Survey team has now shown why: whenever a galaxy grows, so too must the black hole, and vice versa.

### ABOUT THE SLOAN DIGITAL SKY SURVEY (SDSS)

The Sloan Digital Sky Survey ([www.sdss.org](http://www.sdss.org)), when completed, will map in detail one-quarter of the entire sky, determining the positions and absolute brightness of 100 million celestial objects. It will also measure the distances to more than a million galaxies and quasars. The Astrophysical Research Consortium (ARC) operates the Apache Point Observatory, where the SDSS telescopes are located.

SDSS is a joint project of The University of Chicago, Fermilab, the Institute for Advanced Study, the Japan Participation Group, The Johns Hopkins University, the Los Alamos National Laboratory, the Max-Planck-Institute for Astronomy (MPIA), the Max-Planck-Institute for Astrophysics (MPA), New Mexico State University, University of Pittsburgh, Princeton University, the United States Naval Observatory, and the University of Washington.



Caption: A spiral galaxy. Astronomers using data from the Sloan Digital Sky Survey have found that galaxies and black holes go together.  
Image credit: SDSS Collaboration

Full size image available through contact

Funding for the project has been provided by the Alfred P. Sloan Foundation, the participating institutions, the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), the U.S. Department of Energy, the Japanese Monbukagakusho and the Max Planck Society.

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#### GRAPHICS:

<http://www.sdss.org/data/ngc6070.100dpi.jpg> (100dpi, 143KB)

<http://www.sdss.org/data/ngc6070.100dpi.gif> (100dpi, 952KB)

Caption: A spiral galaxy. Astronomers using data from the Sloan Digital Sky Survey have found that galaxies and black holes go together.

Image credit: SDSS Collaboration

NB: If any of these images are used on a Web page, please provide a link back to the Sloan site at <http://www.sdss.org/>

#### CONTACTS:

The following are attending the International Astronomical Union's 25th General Assembly in Sydney, Australia, July 13-26 (see meeting contact numbers at the end of this release):

Dr. Guinevere Kauffmann, Max-Planck-Institute for Astrophysics, Germany  
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Prof. Simon White of Max-Planck-Institute for Astrophysics, Germany  
[swhite@mpa-garching.mpg.de](mailto:swhite@mpa-garching.mpg.de)

#### INTERVIEWS

Dr Kauffman will be available in the IAU General Assembly media room 10:30-12:30 Wednesday July 16 (Australian Eastern Standard Time).

Contact details are below.

The following are not attending the General Assembly, but are available for interview in the USA:

Prof. Tim Heckman, Johns Hopkins University, Baltimore  
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Gary S. Ruderman, Public Information Officer, The Sloan Digital Sky Survey  
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